



SIMPOSIO INTERNACIONAL SOBRE MATERIALES LIGNOCELULOSICOS

NOVEL ASA-TYPE PAPER SIZING AGENTS BASED ON RENEWABLE RESOURCES: FROM MODEL EXPERIMENTS OVER LAB TRIALS TO THE PAPER MACHINE

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ABSTRACT

Internal paper sizing agents are used in paper production to improve the paper's resistance against penetration of water. This is the basis for printability and writeability of paper and increases its durability. In 2010, 25.000 tons of paper sizing agents had been used only in Austria – nowadays mainly ASA (alkenylated succinic anhydride), which is produced from long-chain olefins of petroleum oil, thus being fully based on fossil resources.

Over the past few years, we have developed a new, renewables-based internal paper sizing agent. The most promising starting material for plant oil-based sizing agents, among several plant oils tested, was high-oleic sunflower oils (SOHO). This starting compound as well as the maleation product, maleated high oleic sunflower oil (MSOHO), were comprehensively analytically characterized, including ATR-IR, NMR with full resonance assignment in the ¹H and ¹³C domains, MS in different modes, ozone cleavage, and pyrolysis gas chromatography (py-GC/MS). All relevant characteristics of the product, including sizing efficiency, viscosity, composition of fatty acid residues on the triglycerides, formation of byproducts, and yield of the reaction with maleic anhydride, were determined. The latter reaction was comprehensively studied and optimized.

Compared to conventional ASA, the sizing efficiency of the novel product is similar. The hydrolytic stability, another important property, is even clearly improved. Especially calcium ions, originating from the common paper additive calcium carbonate, are much better tolerated by MSOHO. This results in minimized risk of deposit formation in the paper machine. Furthermore, factors influencing the sizing efficiency of MSOHO and ASA were tested, e.g. the usage of auxiliaries or the common alum (aluminum sulfate) additive. Following comprehensive experiments and tests in the lab and at pilot scale, the applicability of the new sizing agent has been extensively verified at full-scale trials in paper mills.

As a result, for the first time a high-quality internal paper sizing agent is available which is based on plant oils as renewable resources, instead of being based in fossil resources. It represents a technically feasible - and also economically viable - substitute to the traditional fossil-based ASA sizing agents, which are used as a bulk product in the economically important pulp and paper industries.